## *Claims*

What is claimed is:

640    1. A fast high precision matching method comprising the steps of:

       a) Input an image;

       b) Input a template;

       c) Perform initial search using the input image and the template to create an initial search result output;

645        d) Perform high precision match using the initial search result, the input image, and the template to create a high precision match result output.

2. The method of claim 1 wherein the high precision match step comprises the estimation of high precision parameters by image interpolation and interpolation parameter

650    optimization.

3. The method of claim 1 wherein the high precision match step comprises a high precision match within one pixel range.

655    4. The method of claim 1 wherein the high precision match step comprises a high precision match beyond one pixel range.

5. The method of claim 1 wherein the high precision match step performs robust matching.

660

6. The method of claim 5 wherein the robust matching limits pixel contribution.

7. The method of claim 5 wherein the robust matching performs pixel weighting.

665    8. The method of claim 2 wherein the image interpolation includes linear interpolation.

9. The method of claim 2 wherein the image interpolation is applied to the template.

10. The method of claim 9 wherein the template contains pre-calculated template
670 variance parameters.

11. The method of claim 2 wherein the interpolation parameter optimization includes a matching function maximization.

675 12. The method of claim 11 wherein the matching function maximization uses an iterative method.

13. The method of claim 4 wherein the high precision match beyond one pixel range comprising the steps of:
680     a) Perform neighboring position creation using the initial search result to create a plurality of neighboring positions;
    b) Perform matching function maximization on each of the plurality of neighboring positions to create a plurality of maximum of optimal subpixel matches;
685     c) Perform maximum and position determination using the plurality of maximum of optimal subpixel matches to create the optimal subpixel values.

14. A fast high precision matching method comprising the steps of:
    a) Input an image;
690     b) Input a template containing pre-calculated template variance parameters;
    c) Perform initial search using the input image and the template to create an initial search result output;
    d) Perform high precision match using the initial search result, the input image, and the template to create a high precision match result output.
695

15. The method of claim 14 wherein the high precision match step comprises a high precision match within one pixel range.

16. The method of claim 14 wherein the high precision match step comprises a high

700     precision match beyond one pixel range.


17. A fast high precision projection matching method comprising the steps of:

    a)  Input a projection profile;

    b)  Input a template profile;

705         c)  Perform high precision match using the projection profile, the template profile

        to create a high precision projection match result output.


18. The method of claim 17 wherein the high precision match performs interpolation on

the input projection profile.

710

19. The method of claim 17 wherein the high precision match performs interpolation on

the template profile.


20. A fast invariant high precision matching method comprising the steps of:

715         a)  Input an image;

    b)  Input a template;

    c)  Perform initial search using the input image and the template to create an

        initial search result output;

    d)  Perform invariant high precision match using the initial search result, the input

720             image, and the template to create an invariant high precision match result

        output.


21. The method of claim 20 wherein the invariant high precision match step comprises

the estimation of subpixel and subsampling parameters by image interpolation and

725     interpolation parameter optimization.


22. The method of claim 20 wherein the invariant high precision match step performs

robust matching.

730    23. The method of claim 21 wherein the image interpolation includes log-converted radial-angular transformation and linear interpolation.

24. The method of claim 21 wherein the interpolation parameter optimization includes a matching function maximization.

735

25. The method of claim 24 wherein the matching function maximization uses an iterative method.

26. The method of claim 21 wherein the image interpolation is applied to the template.

740

27. The method of claim 26 wherein the template contains pre-calculated template variance parameters.